ORIGINAL ARTICLE

Early Versus Late Tracheotomy in Patients with Severe Head Injury

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ABSTRACT

Objective: *A majority of patients with severe head injury whether treated conservatively or being operated, need ventilatory support and require endotracheal intubation. There has been a great discussion regarding the timing of tracheostomy. In this study we observed our admitted patients with severe head injury and noted the role of early tracheostomy in the outcome of these patients.*

Material and Method: *This study included 50 cases of severe head injury presenting in the emergency department of Neurosurgery, Lahore General Hospital, Lahore.*

Study Duration: *The study duration was two years from October 2010 to October 2012.*

Study Design: *Prospective and analytic study.*

Results: *A total of 50 patients with no sex predilection, ages ranging from 10 years to 60 years were included in this study. The patients were divided into 2 groups. Group A, having 25 patients who underwent tracheostomy earlier and Group B, having 25 patients in whom tracheostomy was done late. According to the timing of tracheostomy, patients were classified as early group A (≤ 7 days; N = 25) or late group B (> 7 days; N = 25). The average time of the tracheostomy procedure was 5.5 ± 1.8 (SD) days in the early group and 11.0 ± 4.3 days in the late group. There were no significant differences between the groups in terms of age, proportion of female sex, GCS, Injury Severity Score, or need for blood transfusion. However, patients in the early group had a significantly shorter stay in the ICU than patients in the late group (19.76 ± 4.4 vs. 28.9 ± 5.6 days; P = 0.0000001). There was no difference between the groups in ventilator days (15.7 ± 6.0 vs. 20.0 ± 16.0 days; p = 0.57) data not shown. There were significant differences between the groups regarding overall mortality 4% vs. 24%; p = 0.041332. Similarly, significant recovery (p = 0.04) was observed in early tracheostomy patients when compared with group B.*

Conclusion: *Early tracheostomy was beneficial, resulting in a shorter ICU stay and decreasing the overall mortality.*

Keywords: *Endotracheal, tracheostomy, conservatively, ventilatory support.*

INTRODUCTION

A tracheostomy is an opening created in the front of the neck directly into the trachea to allow unimpeded breathing. (A tracheotomy is the act of making that opening). Severely head-injured patients, particularly those with additional injuries, often require tracheostomy at some point during their hospital stay. Traditionally, the procedure has been recommended for preventing airway complications. According to Cockroft, early tracheostomy has been advocated as a means to improve outcome, with various studies suggesting that it may decrease the incidence of pneumonia, reduce intensive care unit days and shorten overall length of stay. Some evidence also exists to suggest that early tracheostomy does not improve outcomes. As a result, the timing of tracheostomy in these critically ill

patients remains controversial.

Early tracheostomy patients are defined as those who have a tracheostomy performed during the first seven hospital – stay days. Late tracheostomy patients are defined as those who have a tracheostomy performed at greater than seven days after admission.

In this study population, later tracheostomy patients were in the hospital three times longer than early tracheostomy patients and also spent an average of four times longer time in the ICU. Early tracheostomy patients were 1.5 times more likely to be discharged in an independent state.

MATERIAL AND METHOD

This was a prospective and analytic study. This study was done in the department of neurosurgery Lahore general hospital over a period of two years, from October 2010 to October 2012. Fifty patients were divided into two groups, group A having twenty five patients who underwent early tracheostomy and group B having twenty five patients who underwent late tracheostomy. All these patients sustained severe head injury due to trauma to the head, having a GCS of 7 and below.

SURGICAL TECHNIQUE FOR PLACING A TRACHEOSTOMY TUBE

To perform a surgical tracheostomy, the patient's shoulders are elevated and the head is extended unless contraindicated by cervical disease or injury. This position elevates the larynx and exposes more of the upper trachea.

As with most surgical procedures, prophylactic anti-biotics specific for skin pathogens are usually administered 30 – 60 min prior to skin incision. The skin from the chin to below the clavicles is sterilized and prepared with either an iodine – based disinfectant or a solution of chlorhexidine. Local anesthesia with a vasoconstrictor is infiltrated into the skin and deeper neck tissues to reduce the amount of bleeding and provide analgesia during the procedure.

The skin of the neck over the 2nd tracheal ring is identified, and a transverse stain incision about 2–3 cm in length is created. Care must be taken to avoid cutting deeper than the subcutaneous tissues to prevent lacerating the thyroid isthmus or a large neck vein. Sharp dissection following the skin incision is used to cut across the platysma muscle, with bleeding controlled by electrocautery or hemostats and ties. Blunt dissection parallel to the long axis of the trachea is then used to spread the sub-muscular tissues until the thyroid isthmus is identified. If the thyroid gland lies superior to the 3rd tracheal ring, it can be bluntly undermined and retracted superiorly to gain access to the trachea. If the isthmus overlies the 2nd and 3rd ring of the trachea, it must be mobilized and either a small incision made to clear a space for the tracheostomy or complete transection of the isthmus must be accomplished.

Blunt dissection is continued longitudinally through the pre-tracheal fascia, and the desired ring (usually the 2nd ring) is identified. One of 2 types of tracheal entry is usually used for surgical tracheostomy.

These are: complete removal of the anterior part of the tracheal ring to create the stoma, and creation of a rectangular flap with the severed but still attached part of the ring. In the ring removal approach, the ring is lifted with a tracheal hook and 2 circumferential sutures are placed around the ring laterally. The portion of ring between the secured sutures is then cut and removed, leaving a hole in the anterior tracheal wall for the tracheostomy tube. The sutures are left in place and used to provide counter-traction on the trachea as the tube is forced into the lumen. The ring sutures are cut long and left out of the wound or used to secure the tracheostomy tube.

A second method for entry into the trachea involves creating a tracheal wall flap sutured to the skin. This is done by incising the fascia over the superior ring and entering the trachea along its inferior margin. This becomes the outer lip of the flap. Lateral cuts through the lower ring complete the sharp dissection. The flap thus created is reflected downward and attached with several sutures to the skin of the neck.

Statistical Analysis

Student T Test or Chi square tests were performed using Microsoft Excel to determine significance between the two groups. All data were plotted using the p value of ≤ 0.05 as statistical significance. Error bar represent ± SE of the means.

RESULTS

Out of 50 patients 25 patients were treated with early tracheostomy and included in group A. The other 25 patients were offered late tracheostomy and were grouped as group B.

GROUP A: In this group 25 (50%) were included.

These patients underwent early tracheostomy on the 4th day of their admission. These patients remained in the I.C.U for a period of 16 to 19 days and were weaned off from ventilatory support within 7 to 10 days. Out of these patients 1 patient expired, 8 went home on vegetative state and 17 patients had a good recovery.

GROUP B: In this group 25 (50%) were included. All these patients were offered late tracheostomy on the average of 12th day of admission. These patients developed severe chest infections prior to tracheostomy. Further they had a long stay in the I.C.U (29 days) and remained for a prolonged period of time on ventilatory support. Out of these patients 6 patients expired, 9 went home on vegetative state and 10 patients had moderate recovery.

DISCUSSION

During the early phase after acute brain injury, patients with impaired consciousness may require mechanical ventilation to protect their airway, treatment for intracranial hypertension, and ventilatory support to treat pulmonary complications. After the acute phase and once satisfactory weaning parameters have been achieved, the patient's impaired level of consciousness and inability to protect their airway represent strong reasons why extubation should be delayed. These patients might benefit from continued intubation through prevention of aspiration and because of their limited ability to clear secretions, but it has been shown that prolonged intubation in traumatic brain injury is associated with a high incidence of pneumonia. Conversely, early tracheostomy after trauma reduces ICU length of stay and number of ventilator days, and reduces the incidence of ventilator – associated pneumonia. Koh and coworkers confirmed that patients undergoing early elective tracheostomy had shorter ICU stays than did patients who were given extubation trials before tracheostomy. Kluger and colleagues reported a lower incidence of pneumonia when early tracheostomy was performed in brain – injured patients. Nowak and coworkers identified an increased risk for severe tracheal complications in brain – injured patients who had been intubated for more than 14 days.

The critical issues in developing effective ventilatory management strategies in acute brain – injured patients remain the identification of those patients who are more likely to require long – term ventilatory support and determination of the optimal timing for tracheostomy.

Major and coworkers suggested the utility of daily assessment of objective scores such as Glasgow Coma Scale (GCS) and Simplified Acute Physiology Score; scores on these scales of below 7 and greater than 15, respectively, on day 4 had a high positive predictive value for identifying those head – injured patients who required tracheostomy for prolonged airway protection. Similarly, Namen and coworkers found that a weaning protocol for head – injured patients should always include a neurological assessment using the GCS; a score greater than 8 on the GCS was most accurate in predicting successful extubation without need for reintubation, and avoiding pneumonia and tracheostomy.

Although early tracheostomy may reduce the length of ICU stay and pulmonary morbidity, the first 7 – 10 days after acute brain injury coincide with the greatest incidence of intracranial hypertension; the appropriate timing for tracheostomy in these patients must be considered in view of the risk for severe intracranial hypertension. It is therefore important to keep the intra cranial pressure on the lower side by using the intra cranial pressure lowering maneuvers like intravascular infusions of mannitol; hyperventilation and decompressive craniotomies should be done. Stocchetti and coworkers, in a randomized control trial comparing three tracheostomy techniques, included patients ventilated from 4 days showed better results as compared to late tracheostomy in these studies.

Patients suffering from an acute severe, blunt head injury who underwent tracheostomy more than a week after their hospital admission had nearly twice the risk of developing pneumonia later, compared with those whose tracheostomy was performed during their first week in hospital. According to a study published by critical care surgeon Dr. Nasim Ahmed, "Early tracheostomy reduced the incidence of pneumonia following severe head injury." Patients who did not develop pneumonia had their tracheostomy an average of 9 days after hospital admission, but in patients who developed pneumonia, tracheostomy was performed an average of 11 days following admission. The study showed tracheostomy performed more than 7 days after hospitalization was linked to an 88% increased risk of pneumonia.

In our study of 50 patients the average time of the tracheostomy procedure was 5.5 ± 1.8 (SD) days in the early group and 11.0 ± 4.3 days in the late group. There were no significant differences between the groups in terms of age, proportion of female sex, GCS, Injury Severity Score, or need for blood transfusion. However, patients in the early group had a significantly

shorter stay in the ICU than patients in the late group (19.76 ± 4.4 vs. 28.9 ± 5.6 days; P = 0.0000001) as shown in Figure 1.

There was no difference between the groups in ventilator days (15.7 ± 6.0 vs. 20.0 ± 16.0 days; p = 0.57) data not shown. There were significant differences between the groups regarding overall mortality 4% vs. 24%; p = 0.041332 Figure 2.

Similarly, significant recovery (p = 0.04) was observed in early tracheostomy patients when compared with group B as shown in the Figure 3.

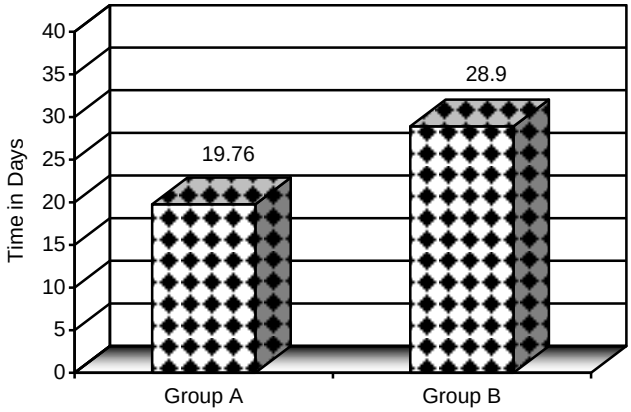

Fig. 1: *Average ICU Stay.*

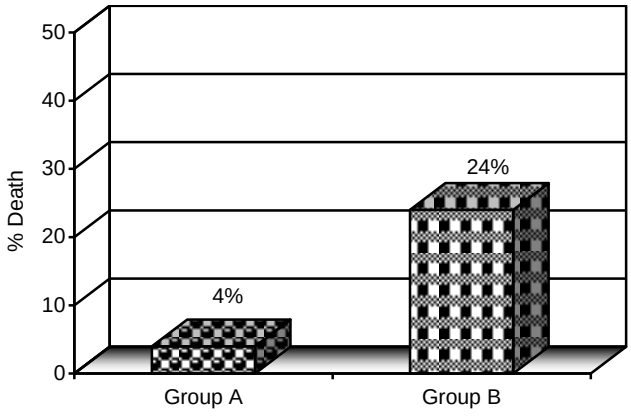

Fig. 2: *Mortality b/w Group A and Group B.*

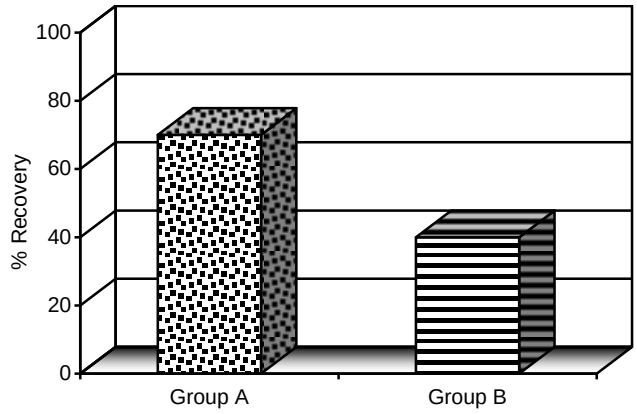

Fig. 3: *% Recovery b/w Group A and Group B.*

CONCLUSION

Early tracheostomy is beneficial in patients who sustain severe head injury, resulting in a shorter ICU stay, decrease the rate of pulmonary infection and above all decreasing the overall mortality.

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